

Method, System, and Apparatus for Balanced Frequency Up-Conversion of a Baseband Signal

Abstract

A balanced transmitter up-converts a baseband signal directly from baseband-to-RF. The up-conversion process is sufficiently linear that no IF processing is required, even in communications applications that have stringent requirements on spectral growth. In operation, the balanced modulator sub-harmonically samples the baseband signal in a balanced and differential manner, resulting in harmonically rich signal. The harmonically rich signal contains multiple harmonic images that repeat at multiples of the sampling frequency, where each harmonic contains the necessary information to reconstruct the baseband signal. The differential sampling is performed according to a first and second control signals that are phase shifted with respect to each other. In embodiments of the invention, the control signals have pulse widths (or apertures) that operate to improve energy transfer to a desired harmonic in the harmonically rich signal. A bandpass filter can then be utilized to select the desired harmonic of interest from the harmonically rich signal. The sampling modules that perform the sampling can be configured in either a series or a shunt configuration. In embodiments of the invention, DC offset voltages are minimized between the sampling modules to minimize or prevent carrier insertion into the harmonic images.